

Monte Carlo simulation of the experimental setup for measurements of entangled annihilation photons

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This work presents the results of Monte Carlo simulation of the experimental setup for study the Compton scattering of annihilation photons in GEANT4. The pair of entangled annihilation photons is born as a result of electron-positron annihilation at rest. The experimental setup consists of Compton polarimeters that include the plastic scatterers and two groups of NaI(Tl) detectors of scattered gammas azimuthally situated around the setup axis. The energy deposition spectra in Compton scatterers and NaI(Tl) detectors are studied. The behavior of the azimuthal correlations of the scattered photons were obtained for a few different cases: a) a pair of photons with random polarizations b) photons with mutually orthogonal polarizations c) photons in a state of quantum entanglement. Clear distinctions in azimuthal correlations for these cases are observed in simulation that allows the comparison the experimental results with the theoretical predictions.

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